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Medium-run macrodynamics and the consensus view of stabilization policy

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Abstract

Policy implications of the present consensus view of stabilization policy depend on specific assumptions with regard to the equilibrium level of production. Thereby, the interpretation of equilibrium output rests on a separation of supply-side and demand-side adjustment to macroeconomic shocks promoting a dichotomy of short-term and long-term macrodynamics.

In contrast to this, there are several channels that promote procyclical stimulus of aggregate demand and a changing factor utilization to the accumulation and efficiency of an economy's productive capacity. Medium-run macrodynamics call for a rather endogenous explanation of production capacity and challenge the uniqueness of long-term equilibria.

Keywords: Monetary policy, medium-run macrodynamics, long-term nonneutrality, capacity utilization.

JEL code: E2, E3, E5.

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"There is a common prejudice in macroeconomics, which is widely shared among policy makers, which they learned in their undergraduate education years and which we still see being developed in most textbooks of intermediate macroeconomics: namely, that there is a perfect dichotomy between, on the one hand macroeconomic policy [...] taken to affect primarily the short-run and whose primary aim is to stabilize the economy; and on the other hand, long-run economic growth, which is either taken to be exogenous or to depend only upon structural characteristics of the economy [...]. The only link between macropolicy and long-run growth that most policy makers believe in, is that growth requires macroeconomic stability everything else remaining equal."

Aghion/Howitt (2005: 24).

1 Motivation

Macroeconomic theories often strictly separate cyclical analysis from trend analysis. Whereas the former is identified as the short-run phenomenon of a varying capacity utilization, the latter is understood as the long-run problem of economic growth that predominantly focuses on the evolution of basic growth factors, such as the supply of labour and technical progress, and disregards problems of macroeconomic stability. In particular, the consequences of monetary policy actions are modeled nonneutral in the short run but neutral in the long run. According to Mankiw (1999: 72) these phenomena of *"short-run nonneutrality and long-run neutrality are [...] as well accepted as any proposition in monetary economics."*

Against this background, it is no suprise that the majority of macroeconomic simulations and econometric models rests on the assumption of a long-run neutrality of montary policy.[1] As *"[i]n the long run, there is [...] a clear dichotomy between the real and nominal variables in the economy"* (Angeloni et al., 2001: 8) the possibility that monetary policy actions may induce real effects that exceed short-term dynamics has been rarely

[1] DeGrauwe/Costa Storti (2007: 49); IFW (2006: 5); IMK (2007: 125 ff).

discussed in mainstream economic literature and consequently has gained little attention in the discussion of monetary policy's stabilization strategies.

For the present consensus model of macroeconomic stabilization policy this dichotomy represents one of the basic conceptual features. As non-neutrality is limited to the short run - interest rate policy affects aggregate demand and enables the central bank to target inflation - Blinder (2004: 2) notes that *"[t]he prevailing view today is that stabilization policy it is about filling in troughs and shaving off peaks, that is, reducing the variance of output around a mean trend that is itself unaffected by monetary or fiscal policy."* As a result, the system does not face a trade-off between real and nominal variables in the long run. According to Taylor (1997: 233) *"[. . .] there is no long-term trade-off between the rate of inflation and the rate of unemployment; a corollary is that a shift by the central bank to a higher rate of money growth will simply result in more inflation in the long run, with the unemployment rate remaining unchanged."*

Such a strict separation between short-term (generally associated with demand-side) and long-term (supply-side) macrodynamics not only provokes concern from the stance of basic insights of the theories of economic growth. As will be discussed below, rather one has to argue that significant changes of capacity utilization that last over several periods may induce procyclical supply-side adjustments. For this reason, several economists such as Aghion/Howitt (2005) raise severe concerns with regard to the corresponding model-setups described above.

The (over-)simplification of an extensively exogenous evolution of productive capacity on the one hand and the mechanisms of procyclical adjustment of production factors on the other hand reveal a strong macrotheoretical tension. According to Solow (1988: 310, 316), exactly this *"[. . .] problem of combining long-run and short-term macroeconomics has still not been solved. [. . .] the fundamental intellectual need is for a common understanding of medium-run departures from equilibrium growth. That is the stuff of everyday macroeconomics. It has been going on in English-speaking countries since Keynes and in Sweden since Lindahl and the Stockholm School."* However, the macrotheoretical

links between the short-run analysis of a varying capacity utilization and the development of growth factors seem to have been lost in the second part of the 20th century.[2] To bridge this conceptual gap, some economists rightly call for the analysis of medium-term macrodynamics.[3] Taking these mechanisms into account challenges basic implications of consensus-type models of stabilization policy.

The paper is structured as follows: Section 2 briefly illustrates key features of a consensus model with regard to outpt-gap adjustment. Section 3 adresses the macrotheoretic background of the concept of potential production. Section 4 highlights arguments in favour of a macroeconomics of the medium run. Section 5 supplements these considerations with the consequences of historical time for standard model analysis. Section 6 highlights the role of investment dynamics for the explanation of macroeconomic fluctuations. Section 7 emphasizes resulting aspects of traverse dynamics. Finally, section 8 concludes.

2 A simple consensus-type model

With regard to output-gap dynamics consensus-type models highlight short-run nonneutrality as an essential feature.[4] Variations of the real rate of interest induce changes in production (and employment). Real effects vanish after a while due to sluggish nominal adjustment.[5] This basic logic of output-gap adjustment will be illustrated within a simple consensus-type model that captures the main implications of *Modern View* macroeconomics.[6] It will be useful for pointing out critical model features and policy implications that rest on the assumption of exogenous equilibrium output and the long-term neutrality of monetary policy.[7]

2 Boianovsky/Trautwein (2006a); Schmid (2010).

3 Blanchard (1997); Setterfield (2002b); Solow (2000a).

4 Goodfriend/King (1997: 279); Gali/Gertler (2007: 31).

5 Allsopp/Vines (2000: 5); Carlin/Soskice (2006: 569); Clarida/Gali/Gertler (1999: 1662).

6 In contrast to the New Keynesian approach, the following illustration abstracts from forward-looking behaviour. Expected inflation is captured by an adaptive pattern $p^e = p_{t-1}$. Autonomous spending does not depend on expected values of the output-gap.

7 Similar model-setups that mimic core mechanisms of output-gap adjustment in an inflation targeting context are provided by Carlin/Soskice (2006), Spahn (2006: 122 ff) and Walsh (2002: 335).

Supply-side dynamics are based on a Phillips-curve relationship (1) that ascribes changes in consumer price inflation p_t to variations of capacity utilization $(y_t - y^*)$ and the evolution of previous inflation p_{t-1}.

$$p_t = p_{t-1} + \alpha \ (y_t - y^*) \tag{1}$$

Aggregate demand is given by (2). Changes in demand y_t are caused by shifts in autonomous spending g_t as well as induced by variations of the short-term real interest rate i_t^r.[8] The coefficient β represents the semi-elasticity of goods demand with regard to the real interest rate. The variable ϵ^d denotes temporary shocks to aggregate demand. As aggregate demand solely represents the demand for consumption goods, long-term implications of a changing demand for goods and production factors (such as capacity variations through investment dynamics) are rarely considered.[9]

$$y_t = g_t - \beta \ i_t^r + \epsilon^D. \tag{2}$$

The behaviour of monetary policy is incorporated by a Taylor Rule reaction function (3).[10] The variable i_t denotes the short term nominal interest rate, r^* represents the natural rate of interest that is supposed to guarantee a stable macroeconomic development in the sense that it harmonizes aggregate demand with aggregate supply and therefore provides a rate of inflation that is in line with the preferences of the monetary authority.[11] To prevent cumulative macrodynamics the central bank is supposed to stabilize output and inflation gaps that may be induced by a varying natural real rate of interest.[12] According to the Taylor-Principle changes in the nominal rate of interest will change the real interest

8 Allsopp/Vines (2000: 9 f); Carlin/Soskice (2006: 82 f, 209 ff, 569); Clarida/Gali/Gertler (1999: 1665); Spahn (2006: 123); Walsh (2002: 343).

9 Carlin/Soskice (2006: 568); Clarida/Gali/Gertler (1999: 1665); Woodford (2003: 242).

10 Carare/Tchaidze (2005: 5 ff); Spahn (2006: 126); Walsh (2002: 336 f).

11 Allsopp/Vines (2000: 9); Boianovsky/Trautwein (2006a: 172 ff); Tamborini (2006: 7 f).

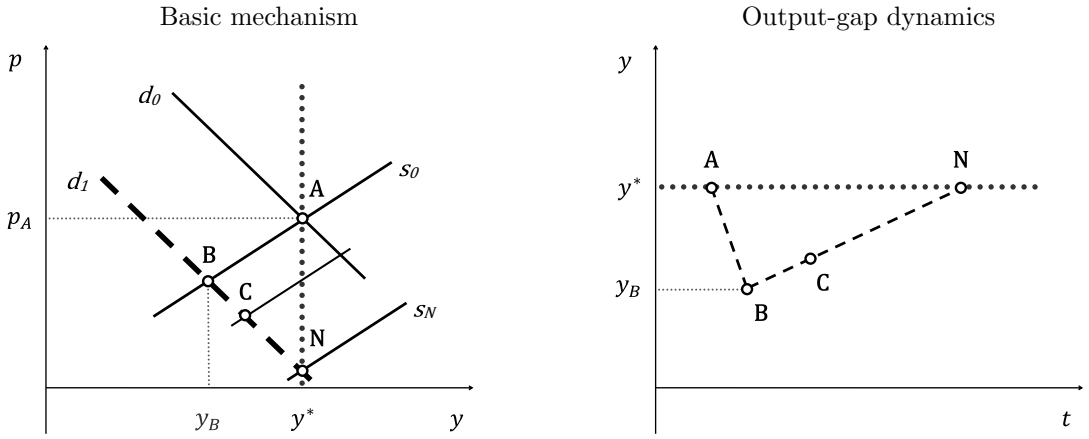
12 Carlin/Soskice (2006: 565); Fontana (2006: 2 ff); Gali/Gertler (2007: 27); Spahn (2006: 126 f); Tamborini (2006: 3); Woodford (2003: 49 ff).

rate.[13] Given the model-setup, this rule is supposed to guide the economic system towards a stable macroeconomic equilibrium.[14] In particular, adjustment after shocks runs with reference to production capacity y^* that is assumed to represent an equilibrium path of real economic development.[15]

$$i_t = r^* + p_t + \gamma\ (p_t - p^*) \tag{3}$$

Figure 1 illustrates the adjustment path that is supposed to result after a decline in aggregate demand ($\epsilon^D < 0$).[16] The latter shifts to the left ($d_0 \rightarrow d_1$). Starting from A the system moves to B and slips below the equilibrium level of production y^*. Temporary underutilization of ressources (negative ouput-gap) leads to the reduction of inflation expectations and the Phillips-curve shifts downwards (from C to N, $s_0 \rightarrow s_N$).[17]

Figure 1: Adjustment to negative demand shock



[13] Allsopp/Vines (2000: 11); Bofinger (2001: 268 ff); Clarida/Gali/Gertler (1999: 1663, 1674); Kerr/King (1996: 48); Walsh (2002: 344).

[14] Bofinger/Mayer/Wollmershäuser (2006); Clarida/Gali/Gertler (1999: 1970 f); Kerr/King (1996: 48); Walsh (2002: 336 f); Woodford (2003: 261 ff).

[15] Spahn (2006: 130); Woodford (2003: 9). In the New Keynesian context equilibrium output is not fixed, but may vary due to stochastic productivity impulses. See, e.g., Gali (2008: 48 ff). However, demand-side impulses are not supposed to induce any adjustment of productive capacity.

[16] Spahn (2006: 135 ff); Walsh (2002: 339).

[17] In contrast to the New Keynesian setup, changing output-gaps are supposed to stimulate firms' demand for labour-input and therefore may affect the unemployment rate.

After its drop from A to B aggregate demand recovers steadily via C to N. Finally, the system reaches its original level of production y^*. The development of productive capacity is assumed to be independent from changes in aggregate demand. There are no (long-term) consequences for the accumulation and efficiency of production factors.

In models that promote a long-run neutrality of monetary policy actions interest rate variations affect real economic conditions only in the short-run and do not alter long-term equilibria.[18] Particularly, this means that demand-side impulses will not alter the accumulation and efficiency of production factors. Within these models *"[a] production function determines potential (natural level) output; the latter acts as a center of gravitation. The supply conditions of the model determine the capacity of the economy. The growth of the labor force and the rate of technical progress dictate long-run growth, given by the Solow growth equation. [. . .] A vertical long-run Phillips curve characterizes long-run potential output (consistent with the NAIRU); there is no long-run trade-off between inflation and unemployment. Monetary policy (interest rate policy) is neutral in the long run: it does not affect real variables, only nominal ones (inflation)."* (Gnos/Rochon, 2007: 376)[19]

In particular, the illustrated path of adjustment suggests that monetary policy faces only temporary costs in the form of transitory losses of output and employment. Hence, consensus models suggest that considerations with regard to policy induced variations of productive capacity do not need to be on top of central bank's agenda.[20]

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[18] Fontana (2006: 11 ff); Fontana/Palacio-Vera (2005: 1, 4); Gali (2008: 5); Kriesler/Lavoie (2007: 388); Meyer (2001: 3); Sawyer (2007: 92).

[19] Setterfield (2002a: 3 f) summarizes: *"[. . .] autonomous changes in aggregate demand can only impact the utilization of ressources in the short run as long as expectational errors or nominal rigidities - both of which are held to be transistory phenomena - interrupt the otherwise neutral (in terms of their impact on real variables) adjustment of prices. Meanwhile, the supply-determined potential output path of the economy - towards which the actual output path of the economy is attracted in the long run - is conventionally assumed to be independent of variations in demand and the transitory differences between actual and potential output to which these give rise."*

[20] Schmid (2010).

3 The equilibrium level of production

The popularity of output-gaps for stabilization analysis documents the central role of equilibrium output. As will be shown, in contrast to standard adjustment, the concept of potential output captures aspects of medium-term macrodynamic adjustment and further analysis of its use reveals notable shortcomings of the consensus view of stabilization policy.

Literature on stabilization policy has introduced several terms and concepts of equilibrium production.[21] The most common and intuitive understanding of the concept of potential ouput in the context of macroeconomic stabilization research is connected to the contribution of Okun (1962).[22] Okun (1970: 132 f) defines the equilibrium level of output as *"the maximum production without inflationary pressure, [. . .] or more precisely [. . .] the point of balance between more output and greater stability."* The concept matches the maximum amount of production from a technical point of view with the degree of factor utilization that may provide a stable development of goods prices.[23]

According to this, rather than solely on the technical dimension, stabilization policy primarily focuses on the level of production that may be in line with a stable development of goods and factor prices.[24] This perspective is also highlighted by Hall/Taylor (1991: 16) as they define the concept of equilibrium production as *"the amount of output that would have been produced had the economy been in neither boom nor recession [. . .] from the existing capital stock and labor force."*

As the efficiency and availability of productive factors determines the amount of goods that can be produced at a certain point in time it is the accumulation and qualitative development of the production capacity that constitute an economy's level of potential output.[25]

In contrast to the rather static view within the context of stabilization policy that (traditionally) focuses on a production capacity that may be given in the short-run, the

[21] McCallum (2001: 261).
[22] Horn/Logeay/Tober (2007: 2); Okun (1962); ZEW (2006: 11 f, 29).
[23] IMK (2007: 30); Kuttner (1994: 361); ZEW (2006: 12).
[24] EZB (2000: 37 f); EZB (2005: 46); Horn/Logeay/Tober (2007: 2).
[25] EZB (2000: 39 f); EZB (2005: 46); Schmid (2010); SVR (2007: 440); ZEW (2006: 8).

analysis of changes in potential output meets fundamental aspects of growth theory. As economic growth is identified with changes in the efficiency and the accumulation of the factors of production variations of potential output are explained by changes of the capital stock, labor supply and technical progress.[26]

Taylor (1997: 233) highlights this view as a fundamental theoretical ingredient for the understanding of the supply-side within consensus models. *"If one adds to this labor productivity growth an estimate of the labor-force growth, one gets an estimate of the long-run growth rate of real GDP, or what is typically refered to as potential GDP growth. This principle, the essence of neoclassical growth theory, provides a way to estimate and discuss the sources of long-term economic growth within the organizing structure of the growth accounting formula."*

However, as the development of production factors cannot be explained independently of cyclical fluctuations (that may be induced by shifts in the demand for factor inputs that are stimulated by variations of factor utilization) changes in potential output cannot be considered independent of changes in aggregate demand.[27]

4 Trend-cycle-dichotomy and the medium run

The assumption of the independence of potential output from changes in aggregate demand reflects a dichotomy of cycle and trend that has been documented by mainstream economic literature for several decades. Although it seems quite common in many models this view has not been propagated by macroeconomic theory ever since.[28]

Since the end of the 1930s growth theory has developed as a self-contained field of macroeconomic research. Multiplier-accelerator-analyses by Harrod (1936, 1939), Lundberg (1937) and Samuelson (1939) had been followed by the neoclassical investigation of equilibrium growth - Solow (1956, 1957) and Swan (1956).[29] Accoring to Solow (1988: 311)

[26] DBB (2003: 44); EZB (2000: 37, 40); EZB (2005: 46); IMK (2007: 16); SVR (2003: 412); SVR (2007: 440).
[27] Schmid (2010).
[28] Hagemann (2008: 151); Steindl/Tichy (2009: 159).
[29] Jones (1975); ZEW (2006: 26, 54).

the analysis of economic growth was supposed to provide specific conceptional mechanisms that fit in the neoclassical research agenda: *"Growth theory was invented to provide a systematic way to talk about and to compare equilibrium paths for the economy."*[30] According to Jones (1975: 97) this brought forward the widely accepted separation of equilibrium phenomena of the long run from short-term disequilibrium analysis. *"The neoclassical achievement in the era of growth theory is undeniable and [. . .] its influence pervades the way economists think about economic growth."*

In the 1950s the separation of cycle and trend as self-contained fields of short-run and long-run macroeconomics was further strengthened.[31] Cyclical fluctuations of aggregate production have been increasingly considered as demand-determined, whereas long-term economic growth has been established as a supply-side phenomenon predominantly focussing on population growth and technical progress.[32] *"[. . .] it has been common to think of business cycle models as separate from models of economic growth and to characterize business cycles as the deviations from some smooth, usually deterministic, trend that proxies for growth."* (Plosser, 1989: 54)

Since the 1980s Real Business Cycle Theories have been interpreted fluctuations of aggregate production as a system's optimal reactions to technical distortions. In this context, cyclical dynamics in the sense of disequilibrium phenomena have not been taken into account. Plosser (1989: 54) explains the decreasing standing of cyclical fluctuations for an economy's long-term growth trajectory with the rising importance of technical progress that itself has been considered independent of (demand-driven) changes of capital utilization. *"While technological progress has been recognized as an important factor determining economic growth [. . .] it has been common to think of economic growth as something that can be studied independently of economic fluctuations. [. . .] it is often presumed that the factors that influence growth have only second order implications for economic fluctuations.*

[30] However, Solow (1988: 311) admits: *"In that task it succeeded reasonably well. In doing so, however, it failed to come to grips adequately with an equally important and interesting problem: the right way to deal with deviations from equilibrium growth."*

[31] Blanchard (2000: 1403); Hagemann (2008: 151 f).

[32] Jones (1975: 180); Solow (1957: 312).

In fact the use of the phrase 'growth theory' was an intentional attempt to distinguish it from a theory of the business cycle.“ As changes in aggregate demand and induced variations of capital utilization have been regarded as transitory and therefore of rather minor relevance for the supply-side development of an economy the importance of stabilization policy with regard to fluctuations of aggregate demand has been reduced.[33]

To a certain extend the separation of trend and cycle may seem plausible because (in contrast to a comparably volatile development of aggregate demand) the implementation and dispersion of technical innovation takes time and the supply of labor may tend to vary rather slowly. Moreover, it is assumed that in the long run markets clear, prices are flexible and aggregate supply creates income that may be absorbed by induced demand, whereas in the short run sticky prices may lead to a domination of the adjustment of quantities over price fluctuations.[34]

However, the dichotomy of short-run and long-run macrodynamics suppresses important aspects that are essential for the analysis of cyclical dynamics and the effects of stabilization policy.[35] According to Hicks (1965: 4 *“[t]he distinction between trend and fluctuation is a statistical distinction; it is an unquestionably useful device for statistical summarizing. [. . .] But this gives us no reason to suppose that there is anything corresponding to it on the economic side which is at all fundamental. We have no right to conclude [. . .] that the economic forces making for trend and for fluctuation are any different, so that they have to be analyzed in different ways.“* In particular, there are several channels that support the view that cyclical changes in aggregate demand stimulate production even in the medium and long run. One might think of changing investment dynamics that determine productive capacity and the efficiency of the capital stock as well as hysteresis on labour markets that alters the effective supply of labour.[36]

As variations of factor utilization that are caused by short-term fluctuations of aggregate demand stimulate procyclical adjustment of production factors long-term economic devel-

[33] Aghion/Howitt (2005:24); Schmid (2010); Solow (2000b).
[34] Ramser (1981: 37); Solow (2000a: 157 f).
[35] Blanchard (1997: 89 f).
[36] Schmid (2010).

opment cannot be explained without short-term macroeconomic outcomes.[37] Furthermore, questioning the separation of short-run and long-run macroeconomic analysis may blur the popular categorization of factor untilization and factor accumulation - consequently the parting line between cycle and growth can not be clearly identified.[38]

According to Solow (1988: 311 f) focussing on medium-run macrodynamics challenges the role of long-term equlibria within macroeconomic models. *"If one looks at the substantial more-than-quarterly departures from equilibrium growth [. . .], it is impossible to believe that the equilibrium growth path itself is unaffected by the short- to medium-run experience. In particular the amount and directions of capital formation is bound to be affected by the business cycle, whether through gross investment in new equipment or through the accelerated scrapping of old equipment. I am also inclined to believe that [. . .] varying amounts of unemployment [. . .] will also react back on the equilibrium path. So a simultaneous analysis of trend and fluctuations really does involve an integration of long-run and short-run, or equilibrium and disequilibrium."*

Taking these channels into account may help to explain the processes that lay between models' long-term equlibria.[39] The resulting interdependence of aggregate demand and aggregate supply (i) questions the existence and uniqueness of long-term equilibria which depend on concepts such as equilibrium output y^* or the natural rate of unemployment u^*, and (ii) supports the view that monetary policy exhibits real effects in the long run.[40]

5 Historical time and path dependence

Due to their complexity processes of economic evolution are often discussed in models that are based on the existence of (long-term) macroeconomic equilibria, the latter serving as a point of reference with regard to adjustment dynamics. In this context, it has become

[37] Blanchard (1997); Solow (2000a).

[38] Blanchard (1997: 89); Hagemann (2008: 151 f); Solow (1991: 16); Steindl/Tichy (2009: 159); Stolper (1982: 254).

[39] Blanchard (1997: 89 f); Blanchard (2000: 1403 f); Comin/Gertler (2003); RWI (2005: 5 f); Setterfield (2002b); Solow (2000a: 157 f).

[40] Boianovsky/Trautwein (2006b); IMK (2007); Lavoie (2004); Setterfield (2004); Solow (1988).

common sense to simulate changes of a system that are caused by macroeconomic shocks in *logical time*.[41] For example, as shown above, the return of the macroeconomic system to a predefined long-term equilibrium seems indisputable. Logical time analysis tends to reduce to the comparison of equilibria but does not question traverse dynamics, therefore, implying costless and timeless adjustment.[42]

However, in real life the adjustment of macroeconomic aggregates to a distortion runs in *historical time*.[43] As the present status of a system is the result of former events, adjustment dynamics in historical time reflect an evolutionary character of macroeconomic development.[44] *"Unlike logical time, historical time is unidirectional and irreversible; it flows in a single continuous stream along which every moment is unique. [. . .] Historical time can never be started over again because it is impossible for history to repeat itself without change."* Therefore, the future growth path of an economy is affected by present and past events.[45] *"[. . .] where a system advances at any particular point in time depends on the path it has taken up to that point."* (Katzner, 1993: 344). Against this background, Setterfield (2002a: 5) concludes that *"[. . .] the essence of macrodynamic analysis is to begin with the short run, and to understand the long run as a historical (path-dependent) sequence of these short-run outcomes."*

Hence, long-term positions evolve from the process of path-dependent short-run constellations.[46] *"As historical time moves on, history is created period by period. To model behaviour in, say, period t, is to explain the history of that period. [. . .] Therefore, it is only the short-run approach that is useful in explaining the events constituting the history that is created from period to period [. . .]."* (Katzner, 1993: 343 f) With regard to the equilibrium level of production Setterfield (2002a: 5) concludes: *"[. . .] Whether viewed in terms of the actual rate of growth achieved or the maximum rate of growth achievable,*

41 Robinson (1980: 219).
42 Lavoie (2006: 14); Robinson (1980: 220 f); Schmid (2010).
43 Georgescu-Roegen (1971: 126); Lang/Setterfield (2006); Robinson (1974); Setterfield (1995).
44 Georgescu-Roegen (1971: 126); Katzner (1993: 323 f); Lang/Setterfield (2006: 191 f); Robinson (1962: 62); Robinson (1980: 221).
45 Kaldor (1972: 1244).
46 Kalecki (1971: 165); Lang/Setterfield (2006: 200); Lavoie (2006: 14); Setterfield (2003: 26).

the point is that 'the long-run trend is [. . .] a slowly changing component of a chain of short-period situations , (Kalecki, 1971: 165) rather than a preordained trajectory."

The consideration of this distinction reveals basic implications for the analysis of stabilization policy in macroeconomic models.[47] As the situation right after the initial shock may be different for a while (due to changes in the values of variables) one might think of a modified adjustment pattern, that takes traverse dynamics into account.[48] In the context of a sequential analysis, a series of similar shocks may alter long-run equilibria in the way that temporary equilibria become the starting point for further adjustment.[49]

6 Monetary policy and investment

Due to its effects on both income and capacity investment dynamics play a central role for the analysis of the business cycle and the deduction of stabilization strategies. Although investment dynamics are at the core with regard to the explanation of macrodynamics, basic consensus models do not account for it and rather focus exclusively on the development of consumer spending. Against this backround, it is remarkable that many authors do not judge this as a serious shortcoming of model analysis. For example, Clarida/Gali/Gertler (1999: 1665) state: *"For convenience, we abstract from investment and capital accumulation. This abstraction, however, does not affect any qualitative conclusions, as we discuss."* In contrast to this, one might argue that models which do not consider investment dynamics seem rather limited.[50]

One explanation may be found in the difficulties of including supply-side adjustment of varying investment spending in the framework of standard consensus-type model-setups. Gali/Gertler (2007) model investment as a function of a changing rate of interest but do not account for induced capacity variations. In contrast to their model, Woodford (2003) motivates an extension of the basic model-setup by explicitely highlighting the effects of

47 Katzner (1993: 325); Robinson (1980: 219 f).
48 Schmid (2010).
49 Haveli/Kriesler (1991: 86); Lang/Setterfield (2006: 200); Setterfield (2002b).
50 Blanchard (2008: 9); Boianovsky/Trautwein (2006a: 182); Fontana (2006: 10 f); Spahn (2008: 126 f); Tamborini (2006: 3 f, 12).

changing investment dynamics on the capital stock.[51] As a result Woodford (2003: 372) concludes that production capacity as well as the equilibrum real rate of interest become a *„function of past monetary policy [. . .] when prices are sticky.“* Consequently, neither the evolution of equilibrium output can be understood independently from movements of aggregate demand nor may disequilibrium adjustment paths end up in unique (predetermined) equilibria.[52]

7 Traverse dynamics

In contrast to the simplification of an exogenously determined equilibrium level of production, the evolution of production factors cannot be explained without the development of aggregate demand.[53] *“[. . .] by determining the potential output of the economy, the natural rate defines a ceiling to the level of economic activity at any given point in time. [. . .] this ceiling is not exogenously determined by supply-side forces. Rather it is sensitive to the demand-determined actual rate of growth. The potential output path of the economy, which defines the maximum level of activity achievable at any point in time, cannot be exceeded by the actual output path. But the potential output path is elastic with respect to the actual output path [. . .].“* (Setterfield, 2002a: 5)

Through the effects of changes in factor utilization on production factors' efficiency and accumulation potential output has to be explained rather endogenously. As mentioned above, this can be motivated by several channels: (i) varying net capital formation, (ii) labour market hysteresis, (iii) investment-induced technical progress.[54]

Refering to these mechanisms Solow (1988: 312) emphasizes that taking procyclical supply-side adjustment into account will change adaptation dynamics to macroeconomic shocks: *„The economy may eventually return to an equilibrium path, perhaps because -*

[51] Woodford (2003: 242 f.; 352 ff).

[52] Amato (2005: 3 f); Boianovsky/Trautwein (2006a: 180); Schmid (2010).

[53] Dutt (2003); Fontana/Palacio-Vera (2005: 1); Kriesler/Lavoie (2007: 391); Palacio-Vera (2005); Setterfield (2002a: 4).

[54] Carlin/Soskice (2006: 567, 573, 612 ff); Dutt (2003: 87); Kriesler/Lavoie (2007: 390 ff); Palacio-Vera (2005: 755); Sawyer (2007: 92 f); Schmid (2010).

prices are flexible in the long run - as we keep telling ourselves. If and when it does, it will not return to the continuation of the equilibrium path it was on before it slipped off. The new equilibrium path will depend on the amount of capital accumulation that has taken place during the period of disequilibrium, and probably also on the amount of unemployment, especially long-term unemployment, that has been experienced. Even the level of technology may be different, if technological change is endogenous rather than arbitrary.“

In the context of stabilization analysis this implies that, in contrast to the consensus view presented above, shocks and policy actions are likely to cause long-term consequences for production and unemployment.[55] *“An output gap that persists over a long period is unlikely from a theoretical perspective. Eventually capital stock adjustments and hysteresis on the labor markets will lower potential output until the gap disappears. Underutilization of capital is small if it exists at all and the long-term unemployed may not be hired at the going wage even if aggregate demand picks up. Since monetary policy is generally believed to be powerful enough to cause output gaps in the short and medium run, the implication for monetary policy is apparent: if output gaps close as a result of labour market hysteresis and capital stock adjustments, then macro policy is not neutral in the long run but rather affects the real economy.“* (Horn/Logeay/Tober, 2007: 4)

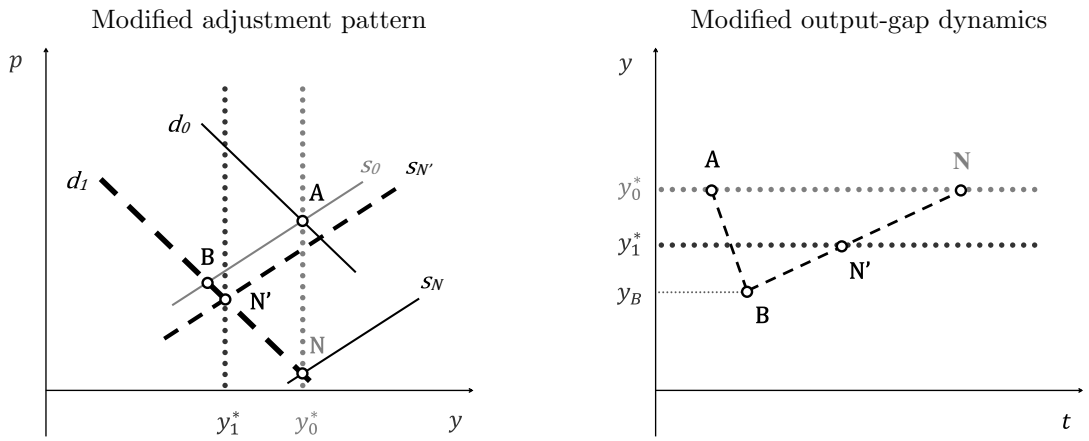
Thus, the analysis of adjustment dynamics within the conceptual framework of monetary policy has to account for path dependence and the existence of multiple equilibria. Figure (2) illustrates corresponding modifications to standard dynamics (Figure 1) that emerge due to procyclical adjustment of productive capacity.

Starting at A aggregate demand shifts to the left ($\epsilon^D < 0$, $d_0 \rightarrow d_1$). The system reaches B. Due to underutilization of production factors potential output declines ($y_0^* \rightarrow y_1^*$). The downward shift of the Phillips-curve corresponds to the endogenously determinded equilibrium output y_1^*.

In contrast to Figure (1) the system's return to N is uncertain. Adjustment rather ends in N'. This new equilibrium depends on the extend of the supply-side adjustment

[55] Mankiw (2001: 48).

Figure 2: Endogenous supply-side adjustment



(Δy^*) and on the occurrence of further shocks. As capacity declines underutilization is less pronounced, therefore, aggregate supply only shifts to $s_{N'}$. In a broader sense this corresponds to the fact that it is rather cyclical than structural unemployment that drives wages. Here, the output-gap no longer closes solely due to the adjustment of current production y, but also because of the procyclical adaptation of equilibrium output y^*.

8 Conclusion

Standard consensus models do not account for investment dynamics and induced supply-side effects of a changing capital utilization. Against this background, monetary policy exclusively exhibits real effects in the short run. At the same time, macroeconomic models that are designed to derive implications for stabilization policy use to rely on the existence of stable and unique long-term equilibria.

However, there are several channels supporting the view that a varying factor utilization will lead to procyclical adjustment of an economy's productive capacity. Changing investment dynamics not only lead to quantitative adjustments of the capital stock, but also stimulate multifactor productivity through technical progress. Moreover, unemployment may forward the emergence of long-term unemployment and reduce the effective supply

of labor by mechanisms of labor market hysteresis. This clearly weakens the conventional agreement of a trend-cycle-dichotomy which still plays a central role within the context of models that are used for stabilization analysis.

Medium-run (traverse) dynamics take alternating stimuli of aggregate demand and supply into account and support the view that the long-term development of an economy cannot be understood without its short-term outcomes. Therefore, stabilization policy that is supposed to be nonneutral in the short run will exhibit long-term effects with regard to output and employment. The impact of a changing factor utilization on the accumulation and efficiency of production factors motivates path dependency and the existence of multiple equilibria. As cyclical movements of aggregate demand play a decisive role for the evolution of an economy's productive capacity stability and uniqueness of long-term equlibria as a system's point of return become uncertain. In particular, output gaps close not only via the shift of aggregate demand but also due to the procyclical adjustment of potential output.

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